



## THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

TOSHIO MATSUMURA ET AL

Ser. No.: 09/594,324

Filed: June 15, 2000

) FILTER FOR REMOVING CONTAMI-  
) NANTS FROM WATER AND METHOD  
) OF FORMING THE FILTER

) Examiner I. Cintins

) Art Unit 1724

DECLARATION OF TSUYOSHI URABERECEIVED  
APR 10 2005  
TC 1700

I, Tsuyoshi Urabe declare that:

1. I am a named inventor on the above-identified patent application;
2. I am currently employed by Mitsuboshi Belting Ltd., the assignee of all rights in the above-identified invention, and have been continuously employed by Mitsuboshi Belting, Ltd. for the last 18 years;
3. I currently hold the title of Project Manager in the Engineering Plastics Section at Mitsuboshi Belting Ltd.; during my tenure at Mitsuboshi Belting Ltd., I have had extensive experience in the design of filter systems utilizing active carbon;
4. The project that resulted in the above-identified invention was undertaken to develop a filter for removing contaminants, as in a household water supply;
5. One focus of the project was to maximize the filtering capability of active carbon as a component in such filters - active carbon is commonly used to remove chlorine, and the like, from an incoming water supply;

6. The objective in the design of such filters is to maximize the exposure of the incoming water to the active carbon as the water passes through the filter;

7. It is well known to form carbon particles into a "block" in such filters by utilizing a polymeric binder;

8. Different sizes of active carbon particles are utilized in filters of the type at issue here;

9. Large carbon particles are often utilized so as to provide a substantial volume of the carbon within the particular chamber within which the carbon is confined in the particular filter design;

10. The use of large carbon particles held together with a polymeric binder has some drawbacks, most notably that the large particles tend to create voids through which water can pass without being adequately exposed to the active carbon for filtering thereby;

11. It is also known to use small diameter active carbon particulate held together with a polymeric binder to avoid the problem in the prior paragraph; however, use of small diameter carbon particles fills up the filter chamber so that the flow rate of water therethrough is potentially adversely diminished;

12. The use of carbon particles held together with a polymeric binder has some drawbacks which depend upon the volume of the polymeric binder; too little of the binder may allow the moving water to create a channel through which a large volume of water passes so that a substantial volume of the carbon does not come into contact with the water; too much of the polymeric binder effectively encapsulates the carbon particles to reduce their effectiveness as a filter material;

13. The goal of the project which resulted in the above-identified invention was to maximize the functional volume of the carbon within the filter, cause exposure of the water to as much of the carbon as possible, and accomplish the first two objectives without significantly impeding flow rate of water through the filter;

14. Prior to the invention herein, to my knowledge, there was no appreciation of the significance of precisely controlling the melt index for the polymeric binder to achieve the objectives noted in the prior paragraph; as an example, U.S. Patent No. 5,882,517, which I understand was cited as pertinent prior art to the above invention in the United States Patent and Trademark Office, describes in column 6, beginning at line 21, a melt index of 1 gram per 10 meters up to 20 grams per 10 meters;

15. I and my co-inventors, as we worked on this project, discovered unexpectedly that a high melt index for the polymeric binder caused an encapsulation of the active carbon particles that obstructed flow through the filter; this caused us to undertake an extensive study to determine what effect the melt index has on the performance of filters containing active carbon;

16. After extensive testing, we found that a polymeric binder with a melt index within a particular range, permitted a high flow rate while sufficiently maintaining the carbon particles in a form with good integrity so that water would flow through and utilize the majority of the volume of the carbon therein without the creation of channels, as described in paragraph 12, above, and while effectively allowing the carbon particles to filter the contaminants from the water supply;

17. Through extensive testing, and specific experimentation, as described in the attached Amendment "A", which I understand was submitted to the United States Patent

and Trademark Office on September 6, 2002, an upper and lower range within which excellent filtering performance was observed was determined;

18. I am not aware that anyone in this art appreciated the effect that melt index of the polymeric binder had on the ultimate end product, i.e. that a melt index of greater than 2.3 g/10 min resulted in a covering of the pores of the active carbon so as to impede water flow therethrough and that the lower limit of the melt index, at 1.1g/10 min, was sufficient to bind the particulate material without covering the fine pores so that water could flow through and effectively be filtered thereby.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: March 25, 2003

Tsuyoshi Urabe  
Tsuyoshi Urabe